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ABSTRACT

This paper presents the theoretical framework for a new course for teacher education. It describes how computers have been used in education and identifies factors that contribute to the unrealized potential of technology use in schools. This new course is consistent with a constructivist view of learning, new educational goals, and a view of the role of technology as a tool that can support the attainment of educational goals and increased student learning. Throughout the twentieth century, each time a new form of media or technology appears on the market, predictions have been made concerning the vast changes that it will undoubtedly bring to classrooms and to the educational process. The arrival of personal computers was no exception. Researchers and futurists predicted great changes to come due to the presence of computers in our schools. The envisioned changes were not realized, however, through the mere existence of machines in classrooms or school buildings. In fact, change has been so slow that in many schools, computers have yet to move from administrative offices to classrooms. Computers are having an enormous and pervasive impact on our business world and on society. The scope of their effect has focused more attention on classroom teachers' use of technology and the perceived failure of education to fully utilize computers in the instructional process. (Contains 12 references.) (Author)

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Creating a Learning Environment For Teachers

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Abstract

This paper presents the theoretical framework for a new course for teacher education. It describes how computers have been used in education and identifies factors that contribute to the unrealized potential of technology use in schools. This new course is consistent with a constructivist view of learning, new educational goals, and a view of the role of technology as a tool that can support the attainment of educational goals and increased student learning.

Throughout the twentieth century, each time a new form of media or technology appears on the market, predictions have been made concerning the vast changes that it will undoubtedly bring to classrooms and to the educational process. The arrival of personal computers was no exception. Researchers and futurists predicted great changes to come due to the presence of computers in our schools. The envisioned changes were not realized, however, through the mere existence of machines in classrooms or school buildings. In fact, change has been so slow that in many schools computers have yet to move from administrative offices to classrooms.

Computers are having an enormous and pervasive impact on our business world and on society. The scope of their effect has focused more attention on classroom teachers' use of technology and the perceived failure of education to fully utilize computers in the instructional process.

A Brief History of Computer Use in Education

Many reasons are cited for why the adoption and use of computers in schools and classrooms has not matched predictions. Primary among these are expense of hardware, as well as lack of adequate software and teacher training. These are definitely real deterrents, but in some schools that have the hardware, software, and training, computers are still sitting in closets or in the back of classrooms, unused.

Teaching the technology is the obvious change that accompanies the introduction of any new technology. With the introduction of computers, some schools that identified the importance of computer skills chose to focus on teaching computers as a separate curriculum while others carefully planned and integrated computer literacy objectives into the curriculum. Still others chose to implement some combination of these approaches (OTA, 1988).

When personal computers first appeared in classrooms, their instructional use took one of two roles. The first use was to teach about the technology itself, including computer literacy and programming language courses. The second use was to support the current curriculum through the use of educational software such as tutorials and drill and practice. In most cases computers were used to support traditional goals, using established methods with as little change as possible to the classroom setting or well-established routines (Olson, 1981, 1980). In such settings, the computer did little to change the curriculum or to truly impact education.

With the growing expectation for the instructional use of computers in classrooms and the identified need for teacher training, colleges and universities began to offer computer literacy courses for teachers. The evolution of these courses has paralleled that of computer literacy courses in schools. Computer literacy courses have evolved from courses that taught about computers (their history and component parts) and introductory computer programming, to courses that have replaced programming languages with basic software applications (word-processing, spreadsheets and databases). These courses have attempted to address how these skills can be used to support *instruction* and how the use of computers can be integrated within the curriculum. They have, however, supported teachers' views of computers as additional content that needs to be taught within an already crowded curriculum.

Factors Contributing to the Use of Technology in the Classroom

The implementation of technology as an instructional tool is a form of educational change and needs to be viewed and treated consistently with what we have learned concerning change. The use of technology is tied to the reform of education (AIT, 1994) in additional ways as well. It can support the attainment of the educational goals that have been identified for success in the information age society of the twenty-first century. One lesson that we must not forget is that reform efforts must deal with the **system** as a whole.

Teacher development has focused on training in the use of technology. Learning to use technology is not sufficient for teachers to make this change in their teaching styles. Even more important than "how-to" training is educating, teaching "why" (Jost and Schneberger; 1994). Teachers, like all learners, need to see the relevance for using the technology. Teachers need to understand how technology can support instruction and learning, how technology can help us to do things (accomplish important educational goals) that either would be very difficult or impossible to do without the technology. This requires a change in seeing the role of computers (or technology) as instructional and learning tools, not as add-ons or content. Demonstrating and discussing the potential of various technologies, introducing new uses of technology, and supporting teachers in exploring different technologies and software can support teachers in constructing a different understanding of their own discipline. Teachers can benefit through activities that support their reflection of what they teach and why.

In order to have teachers use technology in constructive ways that support educational change and educational goals, we must first assess their views on learning and instruction. The use of technology as instructional and/or learning tools is compatible with a constructivist view of learning and instruction (Jost, 1992). In research concerning teachers' integrating technology into instruction, it was also found that teachers' views concerning instruction, learning, and teacher-student roles were not only reflected in the goals that teachers hold for their students but also affords the teaching styles they use and the role that technology can assume in their classrooms (Jost, 1992). Teachers need the opportunity to reflect on *how* and *what* they were taught compared to what is important for today's students to learn. They need to see the consistencies between new goals for education, new theories of learning and instruction, and innovative learning activities and methods of assessment.

Teachers must also construct an understanding of the changing roles of technology, teachers, and students. Learning environments require a change in the roles of both teachers and students. The teacher's role in student-centered learning environments is to guide, stimulate, facilitate and support students' learning activities. Teachers also facilitate student-to-student interaction, modeling desirable thinking and learning behaviors. Using technology as learning tools in the classroom also requires teachers to see their class, including themselves, as a community of learners (AIT, 1994).

Support is a real problem that exists in the culture of educational organizations. The existence of the basic tools is not enough. Teachers are not given the time or the freedom to explore the instructional uses of technology or to redesign curriculum or lesson plans. Teachers need time to experiment and become comfortable with new instructional techniques and with technology.

Why Do We Want Teachers to Use Technology?

Many educators, researchers, and businessmen have emphasized the need to rethink our goals for education. Concurrent with the redefinition of educational goals is the emergence of new assumptions about learning and instruction. Schools are responding by creating information-rich environments for instruction and administration utilizing technology as the vehicle for restructuring education to meet the needs and challenges of our information society.

The use of technology can support the kinds of active environments that research on learning suggest are supportive for enabling students to construct meaningful knowledge. The role of technology within learning environments is that of a learning tool - providing access to information, facilitating inquiry and communication, supporting collaboration and knowledge construction. In

addition it can function as a productivity tool to support other instructional and administrative activities.

These rich environments promote active knowledge construction in authentic and meaningful contexts. They also encourage students to assume a more responsible role in their own learning (Grabinger & Dunlap, 1994); support the development of collaborative decision-making and problem-solving; and foster the development of research and meta-cognitive skills. Social interaction is an important component in these environments, supporting cognitive development (Vygotsky, 1987; Wertsch, 1985). This approach stresses the process of learning, including the important component of reflection, rather than the learning of content alone. This philosophy is consistent with preparing a student for the future.

Based on the assumption that we believe it is important to teach higher-order learning, thinking and inquiry skills that utilize technology as learning tools, we must prepare today's teachers to be capable of implementing an instructional model which affords students the generative learning opportunities which support the attainment of these educational goals (e.g., Cognition & Technology Group at Vanderbuilt [CTGV], 1992). The research of both the CTGV (1992) and Jost (1992) indicate that for teachers to implement an instructional model which effectively uses technology as an instructional tool they must have student-centered, constructive views on learning, and view their role as facilitator rather than as disseminator. Teacher education, therefore, must include teaching and modeling of a generative instructional model, the integration of technology as a tool, and a constructive view of the learning process.

Teaching a philosophy or theory alone is not enough. Teachers must be shown, through modeling, examples of instructional strategies and learning activities that put these ideas into action. Changing one's teaching style is not an easy task. People revert to what's comfortable, which is teacher control, a teacher-directed (content-centered) style. It is easier and is what we have had the most experience with. For many teachers, being able to effectively make the change will first require a conceptual change concerning their beliefs about learning and instruction. A generative learning environment promotes a climate of collaborative inquiry in which questioning and reflection are integral components. Questioning and reflection are also important for promoting conceptual change; therefore, participating in this type of learning environment should support conceptual change.

Teaching with Technology is a new course for teacher education which links the use of technology with appropriate learning theory and pedagogy. It focuses on how students learn and how technology can be used as part of a learning environment that promotes and enhances that learning. This course is also part of a research project that can be characterized as simultaneously working toward change and observing and reflecting on that process. It is a form of Action Research where we are not only studying beliefs, practices, and behaviors (in the form of teacher constructs) but are also attempting to change them in certain ways.

The main objective of this project is to create a learning environment for teachers and teacher educators which will graduate professionals capable of teaching in collaborative learning environments which utilize technology as instructional and learning tools. The theoretical framework underlying this environment includes assumptions about educational goals and the nature of learning. This framework is consistent with the goals expressed by Resnick & Klopfer (1989), the National Council of Teachers of Mathematics (1989), and the American Association for the Advancement of Science (1989).

This R & D project includes the design and development of learning activities and tools which model instructional strategies and provide inquiry into emerging educational goals, methods of assessment, learning activities, and the role of technology in the learning environment. It also includes activities to promote students' reflection on their beliefs concerning learning, instruction, and the role of technology within education.

Significance

The design of innovative educational environments has both theoretical and practical outcomes. The three main aspects to this type of research include: theory-building, research on learning, and design (engineering).

This study can inform instructional designers concerning the design of learning environments and the development of instructional models for teaching-with-technology. It can also inform teacher educators concerning effective methods and desired outcomes for teacher education programs.

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